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IMPROVING THE EFFECTIVENESS OF READY-TO-USE THERAPEUTIC FOODS (RUTFS): A STRATEGIC APPROACH TOWARD MITIGATING ACUTE AND CHRONIC MALNUTRITION WITHIN CHILDREN

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ABSTRACT

Acute and chronic malnutrition remain critical global challenges, particularly in developing nations across Asia and Africa. While significant progress has been made in reducing the prevalence of wasting and stunting, these conditions continue to persist at alarming rates. Ready-to-use therapeutic foods (RUTFs) have emerged as a breakthrough in addressing acute and chronic undernutrition due to their high density of micronutrients and macronutrients, long shelf life, and ease of distribution and consumption. However, their widespread impact is hindered by high production costs and a substantial renal solute load, which limits their accessibility and effectiveness in communities with restricted access to safe drinking water and healthcare funding. Enhancing RUTF formulations by incorporating soybean and oat into peanut-based RUTFs may improve nutritional value, reduce costs, and increase acceptance among children. Furthermore, the development of age-specific RUTF formulations could mitigate the strain on renal function associated with nutrient-dense foods and lower the risk of dehydration-related conditions. Further research is essential to evaluate whether peanut-, soybean-, and oat-based RUTFs offer superior efficacy in treating acute and chronic malnutrition compared to peanut-only formulations.

KEYWORDS: Ready-to-Use Therapeutic Foods (RUTFs), Acute and Chronic Malnutrition, Nutritional Interventions, Global Health Strategies, Food Sustainability

INTRODUCTION

Childhood undernutrition, in all its forms, has a profoundly detrimental impact on communities in developing nations, perpetuating cycles of economic hardship and food insecurity in these vulnerable regions. Global humanitarian efforts have achieved notable reductions in the percentage of children under five affected by undernutrition-related conditions, such as wasting and stunting, since 2000. However, the prevalence of wasting remains alarmingly high, with an estimated global rate of 6.8% in 2022. This issue is particularly acute in developing nations across Asia and Africa, where, in 2022, 78% of children under five diagnosed with severe wasting resided in Asia, and the remaining 22% lived in Africa (Levels and Trends in Child Malnutrition, 2023).

Undernutrition manifests as either acute or chronic malnutrition, depending on the duration of inadequate nutrient intake. Both forms result from insufficient energy or protein to maintain normal bodily functions. Acute malnutrition is typically diagnosed when malnourishment persists for less than three to six months, whereas untreated cases extending beyond this timeframe can progress to chronic malnutrition (Dipasquale et al., 2020). While the effects of acute malnutrition are generally treatable, chronic malnutrition often leads to irreversible consequences.

According to the World Health Organization classification guidelines, acute malnutrition is clinically diagnosed in children who exhibit wasting, defined as a weight-for-height or weight-for-length measurement two or more standard deviations below the median, or a BMI-for-age score two or more standard deviations below the median (IMCI, 2017). Severe acute malnutrition is frequently marked by bilateral pitting edema, which can begin in the feet and spread to other parts of the body (WHO, 2024). Chronic malnutrition, on the other hand, is identified through signs of stunting—measured by a length-for-age or height-for-age score two or more standard deviations below the median—as well as symptoms like cognitive impairments and delayed motor skill development (IMCI 2017; Reinhardt & Fanzo, 2014).

One of the most effective interventions for treating undernutrition is ready-to-use therapeutic foods (RUTF), which has proven instrumental in reversing the effects of acute malnutrition and preventing further deterioration (Bahwere et al., 2024). However, despite significant progress in combating undernutrition globally, RUTFs face challenges such as high production costs and a substantial renal solute load, which hinder their distribution and efficacy in resource-limited settings (Bazzano et al., 2017).

While RUTFs have contributed greatly to addressing acute and chronic malnutrition, further improvements to their formulations are necessary. Refining RUTFs to reduce the risk of dehydration, enhance their nutritional balance, and improve their acceptance among children could ensure broader effectiveness. Additionally, these adjustments are essential to safeguard against rising treatment costs, thereby enhancing the accessibility and sustainability of RUTFs in addressing malnutrition.

METHODOLOGY

This research utilizes a secondary qualitative methodology to explore the effectiveness of Ready-to-Use Therapeutic Foods (RUTFs) in mitigating acute and chronic malnutrition in children. The study examines peer-reviewed articles, clinical guidelines, and reports from global health organizations, focusing on RUTFs' nutritional profiles, limitations, and potential for improvement. This approach was chosen for its ability to synthesize diverse perspectives and provide an in-depth understanding of RUTFs without requiring direct experimentation.

A secondary qualitative methodology enables the identification of trends, challenges, and proposed modifications, such as incorporating soy and oats into peanut-based RUTFs for cost reduction and enhanced efficacy. However, the reliance on pre-existing literature introduces limitations, such as potential biases in source material and a lack of primary data to evaluate proposed solutions in specific real-world contexts. Despite these challenges, this method is effective in establishing a foundation for future experimental studies.

General Information on RUTFs

RUTFs are specially formulated foods meant to be used as nutritional supplements in conjunction with other treatments to rectify micronutrient and macronutrient deficiencies in individuals suffering from acute and chronic malnutrition. RUTFs are generally shelf-stable for about two years and do not require the use of any other ingredients or equipment to prepare them for consumption, allowing them to be distributed and accessed more easily than other treatments for conditions related to undernutrition (Bazzano et al., 2017). These therapeutic foods are usually made with a base that is high in protein and fats like peanuts and are fortified with various vitamins and minerals, including but not limited to sodium, potassium, calcium, zinc, iodine, and vitamins A, D, E, K, C, B1, B2, B6, and B12 to ensure all the afflicted individual's nutritional needs are accounted for and to promote weight gain in the individual (WHO, 2021). RUTFs are also made to be a thick paste, as this ensures that all as young as six months can consume and digest these foods without much difficulty (Bazzano et al., 2017). Therefore, their long shelf life, high micronutrient, macronutrient, and caloric density, as well as their ability to be consumed anywhere without requiring freshwater or heat to prepare them, make RUTFs a valuable asset in the fight against pediatric undernutrition, especially within nations plagued by conflict, drought, or famine.

Efficacy of RUTFs

As with most treatments, RUTFs have their own set of advantages and disadvantages that serve to benefit or harm their comprehensive accessibility and efficacy. One such advantage is their ability to be easily transported and stored. RUTFs are shelf-stable for up to two years after production and do not require refrigeration when in storage (Bazzano et al., 2017). This is mainly because RUTFs have a low water content, which strongly deters bacterial growth in the food, staving off bacterial contamination and spoilage. RUTFs are also generally packaged in single-dose pouches and are therefore able to be easily measured and distributed to those suffering from conditions related to undernutrition. As a result, these factors allow for RUTFs to be transported over long distances and stored without much difficulty because they do not require refrigeration, and they can be left in transit or storage for extended periods of time without spoilage. Moreover, RUTFs can be used to treat acute and chronic malnutrition in any individual over the age of six months, and they do not require the use of water or any other ingredients, or the use of any appliances to prepare them before their consumption (Bazzano et al., 2017; Marzoog et al., 2022). This, in turn, allows for RUTFs to be an accessible treatment for undernutrition-related conditions for nearly the entire global population as they can be used by almost everyone because they can be conveniently eaten anywhere due to their portability. Moreover, they do not need any other ingredients or appliances to be prepared for consumption, allowing those without access to refrigeration or safe drinking water to be able to use RUTFs to treat their acute or chronic malnutrition as well. However, concerns have been raised relating to the overall efficacy of RUTFs due to their high cost and high renal solute load. Although RUTFs are easy to transport over long distances and can be stored for an extended period of time, the average cost of treatment for a child with undernutrition is about USD $200 (Hussein, 2021). This in turn makes it difficult for impoverished families living in war-torn or economically vulnerable areas to be able to afford treatment using RUTFs for their children without the aid of humanitarian organizations, and it further imposes a limit on the number of children that humanitarian organizations are able to fund for the treatment of acute and chronic malnutrition using RUTFs. Furthermore, RUTFs are high in protein, sodium, and potassium, which are all contributing factors to why these foods have high renal solute loads. When consumed, RUTFs place a greater load on the kidneys than most other foods, meaning that the kidneys will require more water to filter the influx of nitrogenous wastes and electrolytes that are introduced into one's bloodstream as a result of consuming nutrient-dense RUTFs (Hussein, 2021). While this may solve the issue of undernutrition in most populations, the use of RUTFs can cause the rate of incidence of dehydration-related illness to rise in communities that lack the ability to obtain clean, safe, and accessible drinking water. Notwithstanding the fact that RUTFs may have their strengths and their flaws, there is still much to be done in relation to improving the overall efficacy of RUTFs by reducing their high cost and high renal solute load.

Changes to Improve the Efficacy of RUTFs

In order to improve the comprehensive efficacy of RUTFs, changes must be made to their formulae to improve upon their shortcomings. Most RUTFs use peanuts as the main ingredient in their formulas as they have a high protein and fat content, which are integral macronutrients to the recovery of individuals with conditions related to undernutrition. Although peanuts have a high protein and fat content, they have a relatively lower carbohydrate content, with about 16.1g of carbohydrates per 100g of peanuts (Peanuts, all types, raw 2019). However, the addition of oats alongside peanuts in RUTFs can supplement the carbohydrates that peanuts lack, as whole grain oats contain around 69.8g of carbohydrates per 100g of oats (Oats,

whole grain, steel cut 2022). The addition of oats in RUTFs can also impart a mildly sweet flavor to the food, which could possibly aid in improving the reception of RUTFs amongst children. Furthermore, peanuts contain a very low amount of the omega-3 fatty acid ALA, with only around 25.34mg of ALA per 100g of peanuts (Huang et al., 2020). On the contrary, soybean oil contains around 6.8g of ALA per 100g of soybean oil, making soybeans the superior source of ALA compared to peanuts (Saava & Kafatos, 2015). This serves to be important as ALA is an antioxidant, meaning that it can be used by the body to support one's immune system in regard to combating infection and disease (Votano et al., 2021). In fact, those who suffer from conditions related to undernutrition are significantly more likely to contract and develop infections than those who are well-nourished (Martins et al., 2011). Incorporating oats and soybean alongside peanuts in RUTF also allows for manufacturing costs of RUTF to be reduced significantly since both oats and soybeans are considerably less expensive than peanuts, meaning that a blend of these ingredients will be less expensive to manufacture and have a greater nutritional content than that of an RUTF made with a base that consists of only peanuts. The creation of specialized dosages of RUTFs for specific age ranges such as infants, children, and the elderly, as well as for individuals like pregnant and breastfeeding women, could aid in reducing the renal solute load they place upon the kidneys. This system will allow for fewer nitrogenous wastes to be produced as it will allow for RUTFs to be specifically tailored to certain groups' nutritional needs, meaning that they will receive about the right amount of amino acids their body requires when they consume the RUTF. In turn, this will reduce the number of individuals who will experience dehydration as a result of needing to produce more urea to filter out the nitrogenous wastes produced from converting excess amino acids into energy (MacDonald et al., 2018). Therefore, the incorporation of oats and soybeans into peanut-based RUTFs, as well as the development of a specialized dosage system for differing age ranges and individuals, would most likely improve their overall efficacy in treating acute and chronic undernutrition in children, as well as in the wider population.

CONCLUSION

While RUTFs are effective in treating acute and chronic malnutrition in children, there is still much to be done in the realm of improving the nutritional balance of RUTFs and in creating RUTFs that specifically target the nutritional needs of children. Consequently, more research and testing must be performed to prove whether an RUTF consisting of a peanut, oat, and soybean base is able to treat conditions relating to undernutrition with greater success than an RUTF with a base that is solely made from peanuts. Thus, one can hope these changes could aid in expunging the cycle of undernutrition-based disease in communities around the world.

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